



CARLO GAVAZZI SPACE SpA

RICH SYSTEM

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1	01/10/2003		FIRST ISSUE
2	07/11/2003		Update of "Applicable documents" list, page 5

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1. SCOPE

The CD-ROM contains the TOF Thermal Mathematical and Geometrical Models used for the analysis.

2. APPLICABLE DOCUMENT

AD	Doc.Number	Issue/Date	Rev.	Title/Applicability
1	RICSYS-SB-CGS-005	06/November 2003	-	TOF CAD 3D model
2	AMS02-IC-CGS-001	2/June 2003	-	Ams-02 Thermal Control System Interface Control Document

3. CD-ROM CONTENT

3.1 TOF

All the files regarding the RICH structure are stored in this folder.

3.1.1 THERMAL MATHEMATICAL MODEL

This folder content is:

File Name	Type	Description
ToF_TMM_v1_1.sin	Document	ToF SINDA model
Register_TOF.txt	Include	Parameters values

Tab. 3-1 Files stored in "Thermal Mathematical Model" directory

The software used for the thermal mathematical analysis is SINDA/FLUINT.

The thermal mathematical model is composed of 885 nodes, representing the external carbon fibre box and the PMTs.

3.1.2 GEOMETRICAL MATHEMATICAL MODEL

This folder content is:

File Name	Type	Description
ToF_GMM_v1_1.inp	Document	ToF TRASYS model

Tab. 3-2 Files stored in "Geometrical Mathematical Model" directory

The software used for the geometrical mathematical analysis is RadCad, exported in TRASYS.



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The thermal geometrical mathematical model is composed of 1576 nodes and 1540 surfaces, representing the external carbon fibre box and the PMTs.

In this model are defined the geometrical characteristics of the different surfaces and their thermo-optical properties. It is used for the calculation of view factors and fluxes (solar, albedo, planet) impinging on the surfaces.



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4. ANALYSIS RESULTS

As an example, the results obtained from the analysis of two different orbits are shown in the following images. Their are obtained using a post processing tool: the results of the complete model (geometrical + mathematical) are shown on the geometrical model.

The colour bar represents the correspondence between colours and temperatures. The temperatures are in Fahrenheit since the model, and the output as well, is in English units.

The first orbit is characterized by a beta angle of 75°, a yaw angle of -2°, a pitch angle of -10° and a roll angle of +1°. The environment is hot. This is one of the hottest orbit for the Lower ToF.

In the following images the temperatures of the Lower ToF external box, of the PMTs inside the box on the RAM side, and of the PMTs inside the box on the PORT side are shown.

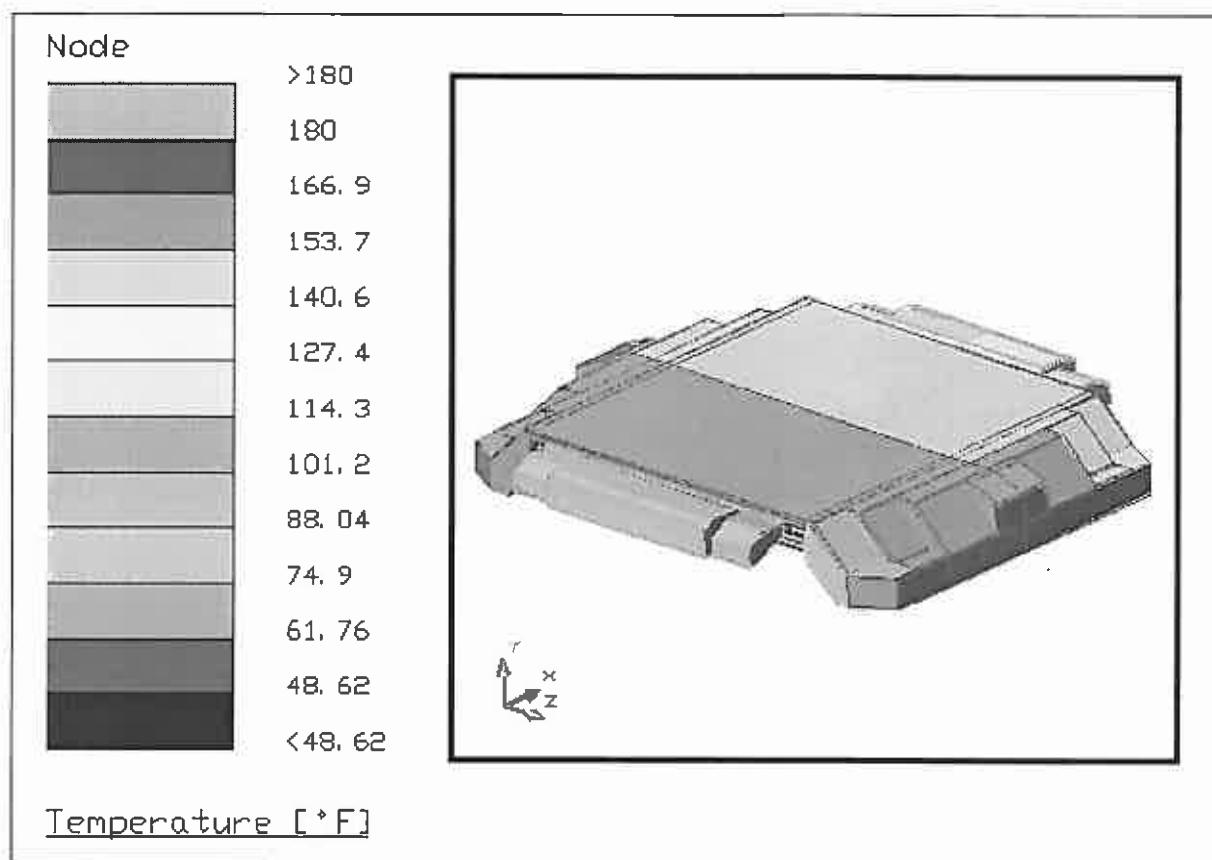


Figure 4-1: Lower Tof temperatures [B-75-2-10+1]

The range of temperature in this case is [48.6°F ÷ 180°F], that is [9.2°C ÷ 82°C].



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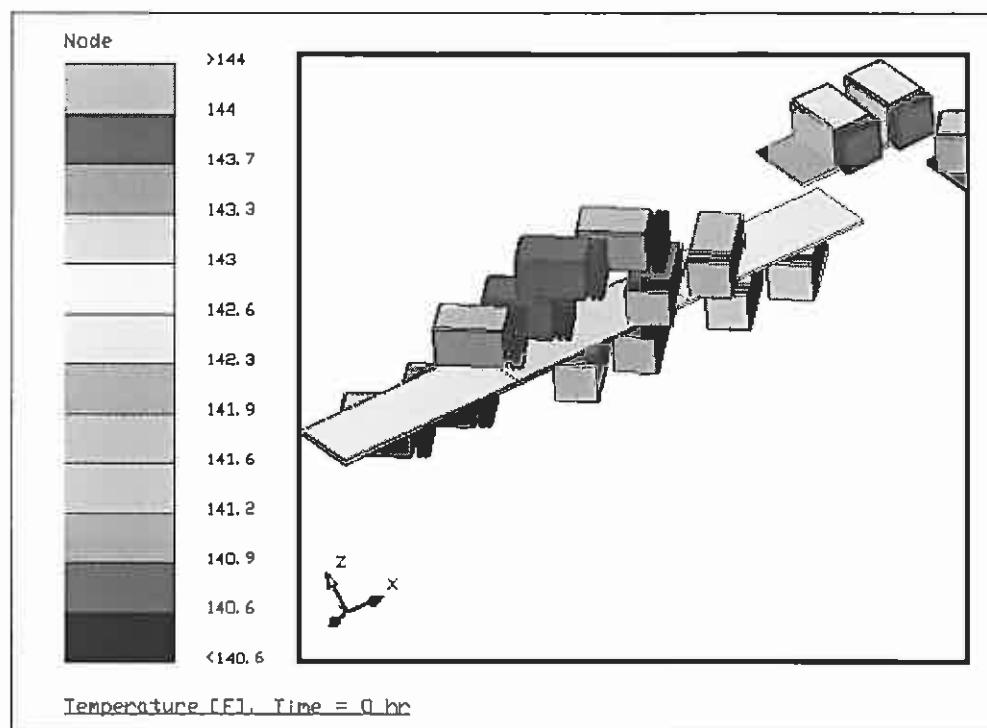


Figure 4-2: RAM PMTs temperatures [B-75-2-10+1]

The range of temperature in this case is [140°F ÷ 144°F], that is [60°C ÷ 62.3°C].

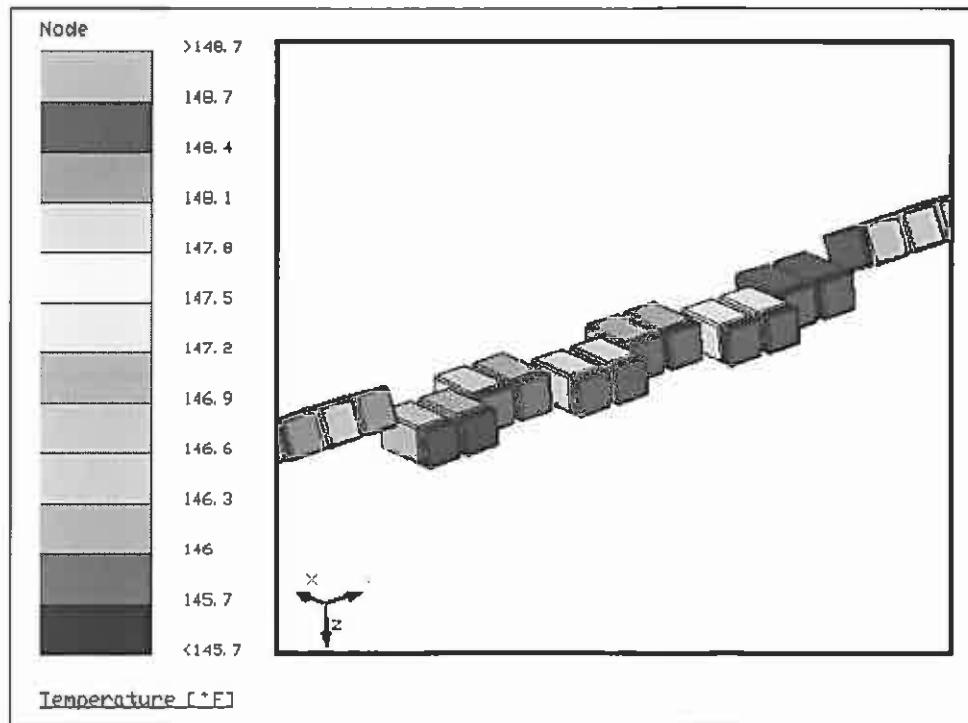


Figure 4-3: PORT PMTs temperatures [B-75-2-10+1]

The range of temperature in this case is [145°F ÷ 149°F], that is [62.8°C ÷ 65°C].



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The second orbit is characterized by a beta angle of 0° , a yaw angle of -2° , a pitch angle of -10° and a roll angle of $+1^\circ$. The environment is hot. This is the colder than the previous one.

In the following images the temperatures of the Lower ToF external box, of the PMTs inside the box on the RAM side, and of the PMTs inside the box on the PORT side are shown.

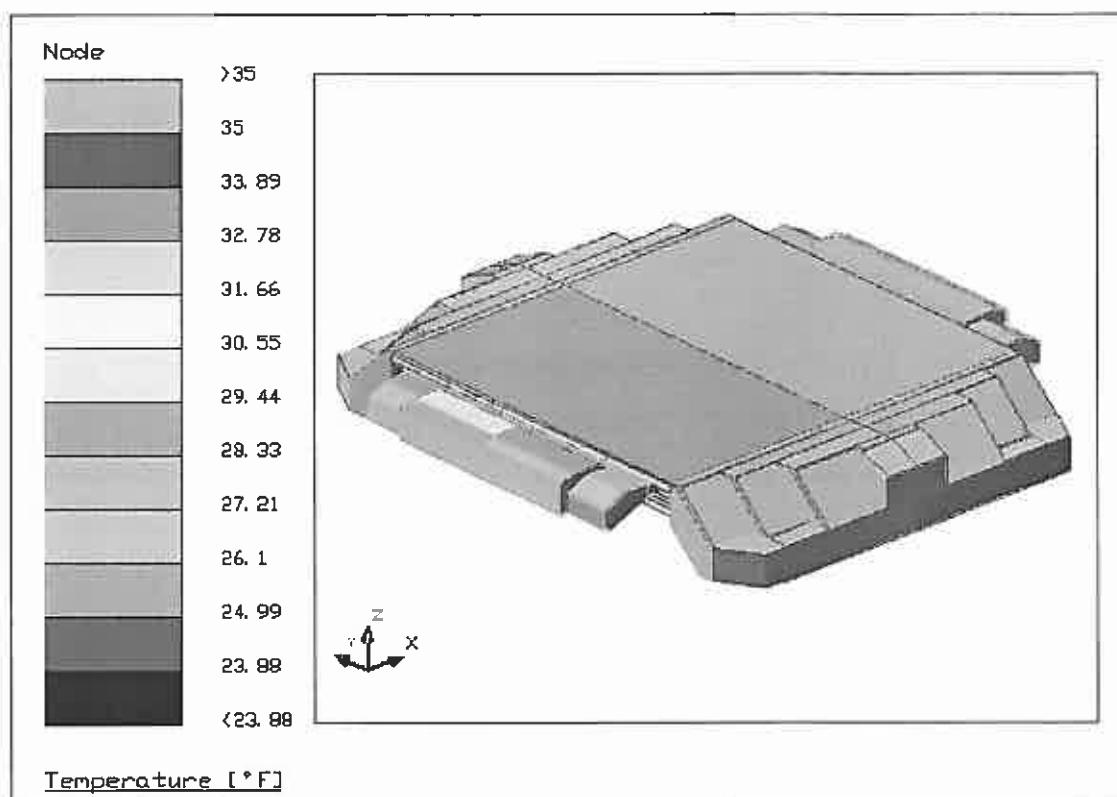


Figure 4-4: Lower Tof temperatures [B 0-2-10+1]

The range of temperature in this case is $[48.6^\circ\text{F} \div 180^\circ\text{F}]$, that is $[9.2^\circ\text{C} \div 82^\circ\text{C}]$.



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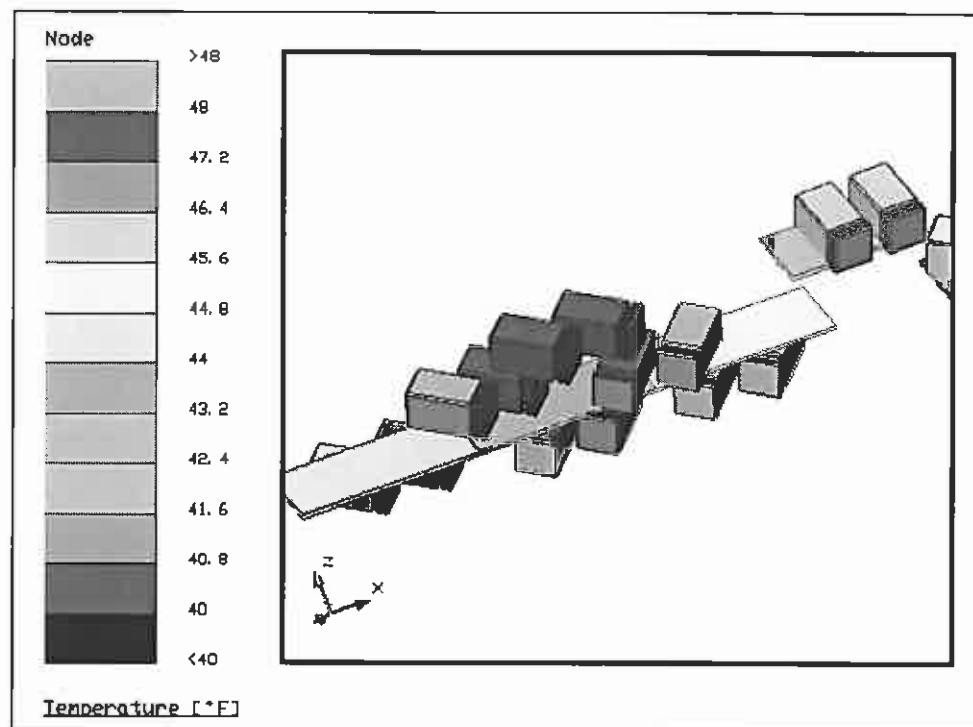


Figure 4-5: RAM PMTs temperatures [B 0-2-10+1]

The range of temperature in this case is [140°F ÷ 144°F], that is [60°C ÷ 62.3°C].

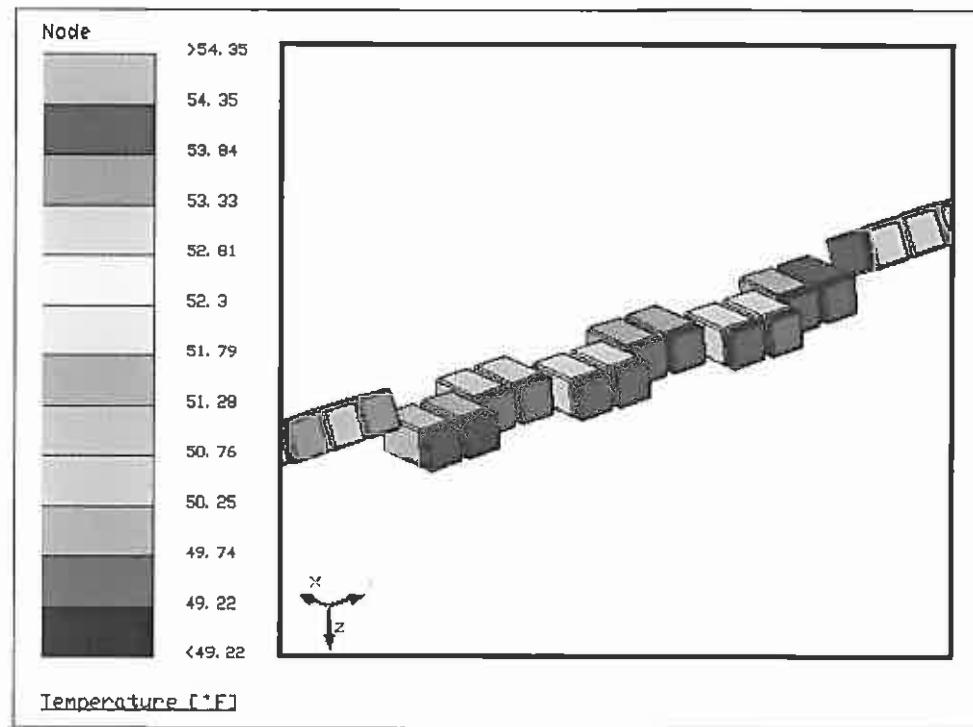


Figure 4-6: PORT PMTs temperatures [B 0-2-10+1]

The range of temperature in this case is [145°F ÷ 149°F], that is [62.8°C ÷ 65°C].